Mecserve Sustainability

Anise Developments Ltd

10 Jamestown Road, Camden

Sustainability and Energy Statement

C5270/HJW

Issue 3 14th April 2010

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Executive Summary

This Sustainability and Energy Statement outlines the various strategies for maximising the environmental performance of the new-build and change-of-use components of the 10 Jamestown Road development. The development aspires to maximise sustainable design features wherever practicable and feasible.

The proposed development is targeting a BREEAM Retail and BREEAM offices rating of VERY GOOD and a Code for Sustainable Homes Level 3 rating. To comply with this the scheme features a range of energy efficient and sustainable design features. BREEAM and Code pre-assessments are included in an appendix at the end of this report.

A detailed energy assessment including a low carbon and renewable energy study has been completed for the new-build and change-of-use components of the scheme. The full assessment details energy modelling results for Building Regulations Part L compliance and a full feasibility study looking at the application of Low and Zero Carbon technologies. For the retail element, the energy results in this report have been based on the Part L compliance tool: Simplified Building Energy Model (SBEM). For the residential element, SAP calculations have been completed.

Key energy efficient design measures incorporated in the proposed design include efficient building services systems, efficient lighting, and building fabric performance that improves on the minimum building regulations standards.

The low carbon and renewable energy study concluded that a combination of photovoltaics and a solar thermal hot water systems presents the best option to achieve the required Camden Council target of a 10% CO_2 reduction. An 11% renewable energy offset was achieved through 22.5m2 of solar thermal hot water collectors and 159.5m2 of photovolatics for the retail component. The use of photovoltaics was also modelled for the residential apartments and it was found that with the same total area of solar collectors (i.e. 182m^2) a 10% renewable energy offset could be achieved through 40m^2 of PVs for the residential component and 142m^2 for the retail component.

The final energy efficiency results (based on solar thermal hot water collectors and photovoltaics) show that across the new and change of use areas there is a 29% improvement on the Part L minimum requirements with 10.7% of this from on-site renewable energy. These results are summarised in Figure 1 below.

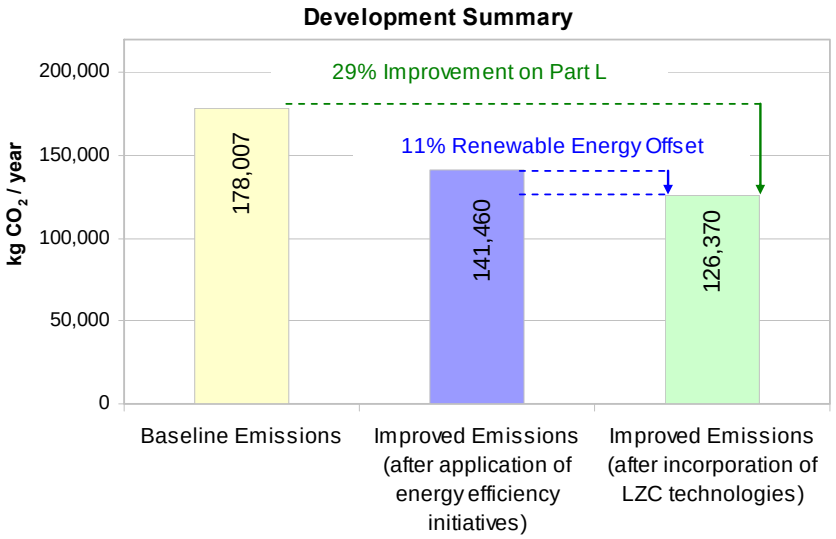

Figure 1 Final Energy Results

1 Introduction

This Environmental Performance Statement report provides an outline of some of the Environmentally Sustainable Design (ESD) and low energy initiatives which will be considered by the design team when developing the design for the 10 Jamestown Road development.

Over recent years, global public opinion has been increasingly concerned with the state of the environment and the impact of climate change. Buildings are responsible for a significant proportion of the world's energy consumption. In the United Kingdom buildings and industry contribute 43%[1] of the total CO_2 emissions. This figure highlights the need for building owners, developers and designers to design environmentally sustainable buildings.

This report provides a review of the sustainability and efficiency benchmarks for the development and sets out targets for the development both in terms of sustainability and energy. Also included in this report is an overview of a number of sustainability and energy-efficiency technologies which are likely to be appropriate for the development.

As the design progresses, the strategies outlined in this report will be further developed and subjected to detailed financial feasibility studies. The environmental strategies and options outlined in this report are based on the current information available and are likely to evolve with the design. The energy calculations presented in this report will need to be continually updated through the detailed design stages to reflect any changes. The energy analysis presented here should be treated as preliminary information based on the currently available data.

1.1 The Development

The proposed development at 10 Jamestown Road Camden consists of the refurbishment and extension of the current building. The building will consist of ground floor retail units, first and second floor office accommodation and two floors of residential apartments. The development features a significant number of sustainable design features, which are detailed in this report.

[1] Department for Environment, Food and Rural Affairs, http://www.defra.gov.uk/, 2008

2 Overview of Environmental Standards, Targets and Policies

This section provides an overview of the environmental rating schemes, mandatory regulations and policy documents applicable to the 10 Jamestown Road development.

Mandatory environmental benchmarks include:

- The requirements stipulated in the relevant Council Development Control Plans; and
- The requirements of Part L of the Building Regulations.

Voluntary environmental benchmarks include:

- The BRE Environmental Assessment Method (BREEAM).
- The Code for Sustainable Homes

Key **national and regional environmental policy documents** consulted in the development of this report and environmental strategies include:

- The London Plan – Spatial Development Strategy for Greater London[2], February 2008.
- Sustainable Design and Construction - London Plan Supplementary Planning Guidance (SPG)[3], May 2006
- Planning Policy Statement 1: Delivering Sustainable Development[4], January 2005
- Planning Policy Statement 3: Housing[5], (2006)
- Planning Policy Statement 22: Renewable Energy[6], (2004)
- Planning Policy Guidance 13:Transport[7], (2001)
- The Sustainable Communities Plan[8], (2003)
- Energy White Paper, "Creating a Low Carbon Economy"[9]
- Camden Planning Guidance (2006)

In addition to the standards, targets and policies discussed above, the following design guidelines may be used to determine the most appropriate Ecologically Sustainable Design (ESD) initiatives for the development.

- Relevant British Standards; and
- CIBSE Guidelines.

2 The London plan – Spatial Development Strategy for Greater London, http://www.london.gov.uk/mayor/strategies/sds/london_plan/lon_plan_all.pdf

3 Sustainable Design and Construction – Supplementary Planning Guidance (SPG), http://www.london.gov.uk/mayor/strategies/sds/docs/spg-sustainable-design.pdf

4 Planning Policy Statement 1: Delivering Sustainable Development, http://www.communities.gov.uk/planningandbuilding/planning/planningpolicyguidance/planningpolicystatements/planningpolicystatements/pps1/

5 Planning Policy Statement 3 (Housing), http://www.communities.gov.uk/publications/planningandbuilding/pps3housing

6 Planning Policy Statement 22: Renewable Energy, http://www.communities.gov.uk/documents/planningandbuilding/pdf/147444.pdf

7 Planning Policy Guidance 13:Transport, http://www.communities.gov.uk/documents/planningandbuilding/pdf/155634.pdf

8 The Sustainable Communities Plan,http://www.communities.gov.uk/archived/publications/thamesgateway/creatingsustainablecommunities2

9 Energy White Paper, "Creating a Low Carbon Economy", http://www.berr.gov.uk/files/file10719.pdf

2.1 Camden Council Planning Requirements

The Camden Council outline their sustainability and energy requirements in the Camden Planning Guidance Document (2006). Under section 17.15 the guidance document requires that developments much achieve 60% of the available BREEAM credit points for energy and achieve a 10% CO_2 offset of the site's electricity and heating requirements where feasible. Section 44.22 of the Camden Planning Guidance document also states that converted or refurbished units greater than 1000m^2 are expected to achieve a Very Good or Excellent BREEAM assessment rating. For the 10 Jamestown Road development this applies to a 10% reduction for the change of use and extension areas. Although not cited directly in the Camden Planning Guidance Documents the Greater London Authority – London Plan sets a target of achieving a 20% offset in site CO_2 emissions through the application of on-site renewable energy systems. The development team have also completed a pre-assessment for the dwellings against the Code for Sustainable Homes standard.

2.1.1 Project Response to the Camden Council Standards and Targets

The Jamestown Road development is aiming to achieve 'Very Good' ratings under the BREEAM Retail and BREEAM Offices schemes. BREEAM pre-assessments for the retail and office components are included in the appendix of this report.

The energy assessment section of this report details the renewable energy strategy to achieve a 10% reduction in CO_2 emissions to meet the Camden council requirement. The scheme falls short of achieving the full 20% renewable energy target set out by the GLA London Plan but, as can be seen in this report, the scheme has maximised the renewable energy resource available at the site.

Under section 17.15 of the Camden Council planning document (adopted December 2006) the development is required to achieve 60% of the energy credit points in BREEAM. This policy document refers to the BREEAM 2006 schemes which is much less onerous than BREEAM 2008.

In the 2008 scheme, the energy category has been significantly extended and it is now very difficult to achieve at least 60% of the credit points for a commercial development in an urban setting where the majority of the development is refurbishment. Table 1 below shows that the proposed development achieves 67% of the BREEAM 2006 Energy Credit points. A summary of the targeted BREEAM 2008 credit points is shown in Table 2.

Table 1 BREEAM 2006 Energy Category Points Estimation

BREEAM 2006 Energy		Achieved by Jamestown Road Development?
ENE 1	**Energy Improvement**	15% Improvement over Part L (6.89 credits)
ENE 2	**Sub- meting of substantial energy uses**	Targeted by the proposed development (0.76 credits)
ENE 3	**Sub-metering of energy use by tenancy / areas**	Targeted by the proposed development (0.76 credits)
ENE 4	**Daylight control of external luminaries**	Targeted by the proposed development (0.76 credits)
Total Target Score for BREEAM 2006 Energy:		**67%**

Table 2 BREEAM 2008 Targeted Energy Points

		Available Credit Points	Targeted Retail Component
Ene 1	**Reduction of CO_2 Emissions**	**15**	**3**
Ene 2	**Sub-metering of Substantial Energy Uses**	**1**	**1**
Ene 3	**Sub-metering of high energy load Areas and Tenancy**	**1**	**1**
Ene 4	**External Lighting**	**1**	**1**
Ene 5	**Low zero carbon technologies**	**3**	**2**
			38%

2.2 The Building Regulations: Part L

The Building Regulations Part L (Conservation of Fuel and Power) applies to all components of the development. Satisfying the Part L requirements became mandatory on April 6th 2006. In order to meet the performance requirements of Part L, the design of the building must comply with the prescriptive provisions laid out in the Compliance Checklist. Included in this checklist is a provision that the simulated building design must pass the energy assessment criteria to achieve an acceptable CO_2 emission rate.

The commercial elements at 10 Jamestown Road development falls under the Building Regulations Part L category of L2B – Existing Buildings Other Than Dwellings. The residential element falls under L2A

2.2.1 Project Response to the Building Regulations Part L

All components of the 10 Jamestown Road development will be designed to exceed the requirements of the Building Regulations Part L. The Energy Assessment sections in this report, detail the energy modelling process to determine the Target Emission Rate (TER) for each component of the new and change of use areas. The energy assessment details a number of energy efficiency improvements and a renewable energy analysis which lead to significantly reduced CO_2 Emission Rates for the development.

2.3 BREEAM

The Building Research Establishment Environmental Assessment Method (BREEAM) was developed in 1990 and consists of a suite of rating schemes designed to assess the sustainability and environmental impact of a building / development. The BREEAM tools set a benchmark for the performance of best practise buildings in the United Kingdom.

The BREEAM 2008 tool consists of 9 categories plus an additional innovation category as listed below:

1. Management
2. Health and Well-Being
3. Energy
4. Transport
5. Water
6. Materials
7. Waste
8. Land Use and Ecology
9. Pollution
10. Innovation

Figure 2 BREEAM Logo

A building's BREEAM rating is dependant on the building achieving the necessary credit point percentage benchmarks as well as complying with the mandatory credit points corresponding to the target rating. The 2008 BREEAM tool also has an innovation category where additional credit points can be achieved through implementing new technologies or sustainable initiatives. The final BREEAM rating is determined by applying a series of environmental weightings to the each category of credit points. The rating tool is not designed to have every credit point achievable for every development and there will inevitably be tradeoffs between many credit points.

Table 3 Summary of BREEAM Ratings

BREEAM Rating	Percentage of Points Required
Pass	30%
Good	45%
Very Good	55%
Excellent	70%
Outstanding	85%

2.3.1 The Project Response to BREEAM

To comply with Camden Council requirements, the development at 10 Jamestown Road aiming for BREEAM Very Good ratings for the retail and office components. A very good rating requires that the schemed to achieve a minimum weighted credit point score of 55%. To ensure this rating, a higher percentage of credit points under each scheme will be aimed for.

The preliminary BREEAM Assessments are found in Appendix A.

2.4 Code for Sustainable Homes

The Code for Sustainable Homes became a government mandatory national standard for all new homes on the 1st of May 2008. The Code for Sustainable Homes is based on the EcoHomes scheme developed by the Building Research Establishment (BRE).

The Code uses a 'star' rating scheme with each Level from 1 to 6 identified with the corresponding number of stars. The Code Level ratings with the corresponding number of required credit points are detailed in Table 3 below.

Table 4 Code for Sustainable Homes - Rating Levels

Code Level	Description	Credit Points Required			
		Energy	Water	Other	Total
1 (★)	Above regulatory standards. A similar standard to the Building Research Establishment (BRE) Ecohomes *pass* level and the Energy Saving Trust's (ETS) Good Practice Standard for energy efficiency	1.2	1.5	33.3	**36**
2 (★★)	A similar standard to the BRE Ecohomes *Good* level	3.5	1.5	43.0	**48**
3 (★★★)	A broadly similar standard to the BRE Ecohomes *Very Good* level and the EST's Best Practice Standard for energy efficiency	5.8	4.5	46.7	**57**
4 (★★★★)	Broadly set at current exemplary performance	9.4	4.5	54.1	**68**
5 (★★★★★)	Based on exemplary performance with high standards of energy and water efficiency	16.4	7.5	60.1	**84**
6 (★★★★★★)	Aspiration standard based on zero carbon emissions for the dwelling and high performance across all environmental categories	17.6	7.5	64.9	**90**

A Code Rating is determined by achieving the minimum standards for the categories energy and water; as well as additional sustainability design criteria. Once the minimum prescribed standards of the Code are met, developers can pick and choose additional credit points from other sustainability categories to achieve a desired code rating. The Code for Sustainable Homes categories are listed to the left below:

1. Energy CO_2
2. Water
3. Materials
4. Surface water run-off
5. Waste
6. Pollution
7. Health and Well-being
8. Management
9. Ecology

Figure 1 shows the breakdown of Code points for each category. It is evident from this graph that energy performance of the building is a heavily weighted category in the Code for Sustainable Homes Scheme.

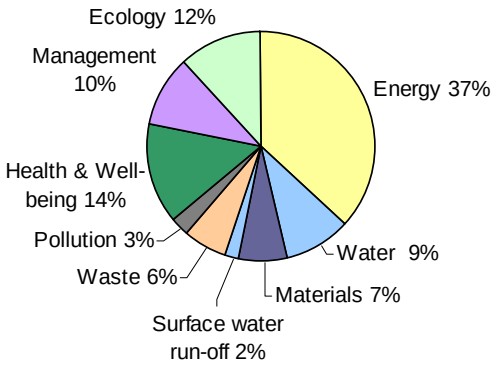

Figure 3 Code for Sustainable Homes Credit Point Breakdown

2.5 Project Response to the Code for Sustainable Homes

Although not a formal Camden planning requirement, the development team have used the Code for Sustainable Homes to demonstrate how sustainable design has been incorporated into the development from the earliest design stages.

Table 4 below provides a summary of the main design features integrated into the development to achieve a Code for Sustainable Homes Level 3 rating. A Preliminary Code for Sustainable Homes Assessment that achieves a Code Level of 3 is found in Appendix B.

Table 5 Main Design Features to Achieve a Level 3 Code for Sustainable Homes Rating

CSH Category		Project Response
1	**Energy & CO_2 Emissions**	Specific measures incorporated into the scheme to address energy issues within the code include: ▪ Dwellings will achieve a minimum of 25% CO_2 emissions reduction over and above regulatory requirements including a significant contribution from on-site renewable energy systems. ▪ Dedicated low energy lighting fittings for 75% of internal lighting and low energy light fittings for external and security lighting ▪ Drying space is provided for clothes ▪ Eco-labelled white goods supplied with each dwelling ▪ Solar thermal hot water systems contribute to a 14% to the reduction in CO_2 emissions
2	**Water**	Where possible the use of low water use fitting including dual flush toilets, low flow fitting and water efficient white goods will be specified in the design to meet at least the minimum Code Level 3 requirements.
3	**Materials**	Materials have been assessed against the BRE Green Guide to Specification. Materials used in the development include: ▪ High performance double glazing ▪ External walls with a U-value of 0.25 W / m^2 K ▪ External roof with a U-value of 0.15 W / m^2 K ▪ Timber construction for suspended floors, party floors and roof ▪ Timber products will be obtained from Forest Stewardship Council (FSC) approved sources
4	**Surface water run-off**	Best practice standards with regards to surface water run-off have been incorporated into the proposed design.
5	**Waste**	Specific measures incorporated into the scheme to address waste issues within the code include: ▪ Provision of minimum of 30 litres of waste separating bins in each kitchen as well as adequate external bin storage. ▪ Site waste will be monitored and reduced through a Site Waste Management Plan which will require waste to be sorted, re-used or recycled.

Continued design features to meet code for Sustainable Homes Level 3…

CSH Category		Project Response
6	**Pollution**	Specific measures incorporated into the scheme to minimise pollution within the code include: ▪ Insulants are specified as those with an Ozone Depleting Potential (ODP) of zero and a Global Warming Potential (GWP) of less than 5 ▪ Nitrogen oxides (NOx) emissions into the atmosphere have been reduced through the careful selection of a heating system and through solar thermal hot water systems.
7	**Health and Well-Being**	Health and well-being has been maximised in the proposed design, specific initiatives relating to this issue are: ▪ Where possible daylight has been maximised to the dwellings through passive measures and high performance glazing. ▪ Lifetime Homes Credits will be targeted.
8	**Management**	Specific measures incorporated into the scheme to address management issues within the code include: ▪ Provision of Home User Guides for every dwelling ▪ The contractor will be expected to exceed best practice standards under the Considerate Contractors scheme ▪ The construction site impacts will be monitored including CO_2 emissions from site related activities
9	**Ecology**	Specific measures incorporated into the scheme to address ecology issues within the code include: ▪ Protection of any features of ecological sensitivity identified on site

3 Energy Assessment

The following Energy Assessment section details the methodology of building simulation to arrive at the Target Emission Rate for the commercial and residential elements of the 10 Jamestown Road development. Based on this Target Emission Rate, energy efficiency options are investigated and implemented in the building model to arrive at a reduced Building Emission Rate. The final section of this Energy Assessment evaluates different low and zero carbon technology options to further reduce the developments CO_2 emissions.

3.1 Energy Assessment Objectives

The objective of the energy assessment is to demonstrate the effectiveness of energy efficiency measures incorporated into the proposed development and to assess the opportunities for adding on-site renewable energy systems to the development. The development team's objective is to deliver an efficient building to reduce running costs and environmental impact.

3.2 Energy Efficiency Philosophy

The design of the development has followed a hierarchical approach to energy efficient design as set out below:

1. Optimise building form and fabric
2. Install efficient energy systems
3. Provide suitable low and zero carbon technology systems

By following this hierarchical approach, efficient and cost effective building design solutions are developed.

3.3 Assessment Methodology

3.3.1 Assessment Software

Extensive energy modelling has been completed for the commercial element using the Simplified Building Energy Model (SBEM) calculation procedure. SBEM is the approved methodology for rating the energy performance of non-dwelling buildings and complies with the National Calculation Method (NCM). The energy modelling tool is used to demonstrate compliance with AD L2A of the Building Regulations and for Energy Performance Certificates for new non-dwellings. The various models were built and analysed using the Design Builder (2.0.2.004) SBEM interface which incorporates SBEM v3.4a.

The SBEM computation takes into account energy used for heating, cooling, lighting, hot water provision and auxiliary power for pumps and fans.

SAP is the Standard Assessment Procedure for calculating CO_2 emissions form domestic properties. The residential element has been modelled using the JPA interface to SAP 2005 v9.81.

3.3.2 Modelling Assumptions

- Building geometry and layout information has been taken from detailed drawings provided the Architects.
- Information on the fabric performance has also been provided by the architect.

3.4 Baseline Energy Calculation

The first step of the calculation procedure is to establish an energy baseline for each area of the building. This enables an assessment to be made of the improvements to the building fabric, systems and the application of renewable energy systems.

For non-dwellings, the Target Emissions Rate (TER) calculated by the SBEM software can be used as a benchmark. The Target Emission Rate is the maximum allowable carbon dioxide emissions per unit area of energy use in cooling, heating, hot water and lighting which would meet the Building Regulations.

The calculated TER and corresponding annual CO_2 emission are shown in Table 16 below.

Table 6 Baseline Energy Calculation

	TER (Target Emission Rate)	Baseline Emissions (Part L Minimum)
	kg CO_2 / m^2 / year	kg CO_2 / year
Office	49.0	52,324
Retail	122.6	164,432
Residential Units	17.7	13,575
Total	**72.5** (Area weighted)	**230,331**

3.5 Energy Efficiency Improvements

3.5.1 Passive Energy Efficiency Measures

Following the hierarchical approach outlined in the introduction, the aim of improving the building energy efficiency begins by looking at the form and fabric.

- **Building Fabric:** The building fabric has been improved significantly beyond the minimum requirements of the building regulations. The following table sets out minimum standards and the proposed standards for the development.

Table 7 Construction standards for 10 Jamestown Road Development

Fabric Element	Limiting U-Value Standards	Proposed Standard
	W / m^2.K	W / m^2.K
Walls	0.70	0.25
Ground Floor	0.35	0.25
Roof	0.35	0.15
Glazing	3.3	5.4 Retail Display 1.70 Residential 1.70 Offices

- **Glazing:** The proposed glazing also achieves a thermal energy transmission ('G' value) of 0.40 with a light transmission of 0.6 which is optimised for a balance between day light and solar heat gain to reduce cooling loads. Display glazing is not subject to a building regulations limiting value however the impact is taken into account for CO_2 emission calculations.
- **Air Permeability:** The air permeability of building is decided to achieve 10 m^3/m^2.hr at 50Pa for the refurbished areas and 5 m^3/m^2.hr at 50Pa for the new residential areas.

3.5.2 Active Energy Efficiency Measures

The second step in the energy hierarchy is generally to improve the building systems. For this development the retail units are provided as a shell which allows the tenant to install as per their own requirements. Energy efficient light fittings and services will be encouraged for the tenants. For the basis of the energy modelling, VRV systems was modelled for the commercial areas. Tenants who fit-out the unit with energy efficient lights and efficient services will see a greater reduction in the emission rates.

Retail	Efficient display lighting and control of lights.
Offices	Efficient T5 lighting with occupancy sensors, high efficiency VRF systems.
Residential	75% energy efficient light fittings, efficient gas condensing boilers.

3.5.3 Energy Efficiency Results

Based on the above described energy efficiency initiatives a 20% reduction on the Part L minimum is achieved across all elements of the development. The calculated Building Emission Rate (BER) and corresponding energy efficiency improvement for each component are shown in Table 8 below.

Table 8 Energy Efficiency Results

	TER (Target Emission Rate)	BER (Building Emission Rate)	% Energy Efficiency Improvement
	kg CO_2 / m^2 / year	kg CO_2 / m^2 / year	
Office	49.0	40.6	17%
Retail	122.6	96.1	22%
Residential Units	17.7	16.4	7%
Totals	**72.5**	**58.2**	**20%**

4 Low and Zero Carbon Technology Analysis

The Camden Council set a target of 10% of predicted energy consumption to be offset by low and zero carbon technologies. The GLA sets a target of 20% of predicted energy consumption to be offset. The following section sets out an overview of low and zero carbon technologies considered for the 10 Jamestown Road development, including:

1. Community Heating and Cooling;
2. Combined Heat and Power (CHP);
3. Biomass Boilers;
4. Wind Turbines;
5. Ground Source Heat Pumps/Cooling;
6. Solar Hot Water Heating; and
7. Solar Photovoltaic Panels.

4.1.1 Carbon Emissions Offset Target

Table 9 below summarises the CO_2 emissions offset required to achieve a 10% reduction in CO_2 emissions across the new and change of use areas.

Table 9 Low and Zero Carbon Offset Targets

	Total Amount of CO_2 to be Offset per Year (to meet 10% reduction)
	kg CO_2 / year
Residential and Retail Reduction Required	14,146

4.1.2 Low and Zero Carbon Technology Calculations

Renewable energy options have been modelled using bespoke software tools based on energy performance product data and published standards from the Chartered Institution of Building Services Engineers (CIBSE). Any additional assumptions have been listed as they are used in the report. Estimated CO_2 reductions quoted in this report have where possible been based on the simulated model results of the SBEM compliance tools.

The emissions fuel factors used in the calculations have been taken from the 2010 Building Regulations document as listed below:

Carbon dioxide factor for **natural gas:** 0.206 kg CO_2 / kWh

Carbon dioxide factor for **grid supplied electricity:** 0.591 kg CO_2 / kWh

Average energy prices used in the financial analysis calculations are as follows:

Average cost **gas:** £0.04 £ / kWh

Average cost **electricity:** £0.10 £ / kWh

4.2 Community Heating and Cooling

A community heating and cooling scheme utilises a centralised energy centre to provide heating and cooling for a series of developments. A remote energy centre would house gas fired boilers or a combination of gas-fired boilers, CHP engines and renewable heat sources as well as chilled water generating equipment. The chilled water and hot water are then distributed from the energy centre to each building. Each building has an individual metered heat-exchanger which transfers heating and cooling into the development. Figure 3 below gives a basic outline of a community heating and cooling scheme.

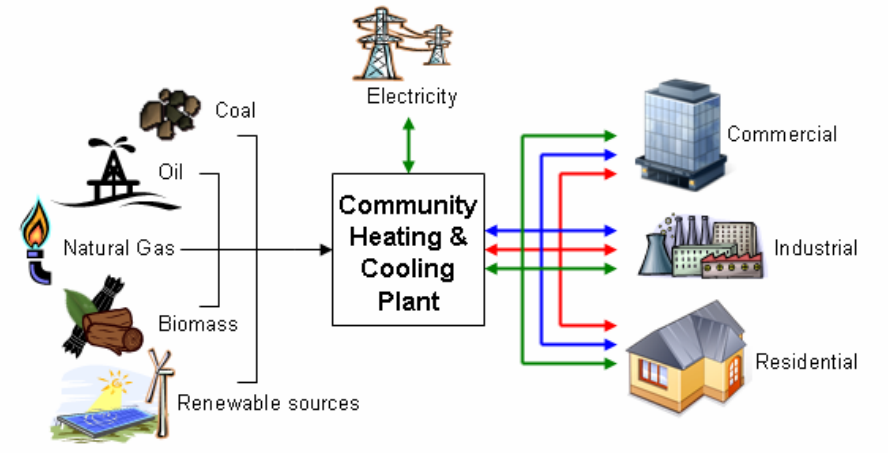

Figure 4 Centralised Community Heating and Cooling Plant

The main advantages and disadvantages of a community energy scheme are discussed below:

Advantages:

- ✓ The central plant can run efficiently as they can run for longer periods of time at close to full capacity.
- ✓ The installed capacity is less for a community system compared to individual systems.
- ✓ A community scheme takes advantage of the diversity of use across a number of developments. Community schemes work particularly well where there is a diversity of use across them, for example if there is a mixture of housing, retail, education and leisure facilities which will have a high diversity of demand.

Disadvantages:

- × A community energy scheme requires significant maintenance and management after completion
- × Building occupants need to be tied in to commercial agreements with the energy provider for significant periods of time if the community scheme is to work economically.

4.2.1 Community Heating and Cooling Project Impact

There are no existing community heating and cooling schemes in the area and it is unlikely that the scheme for this development would be large enough for a third party Energy Service Company (ESCo) to be interested in starting. For these reasons we would not recommend a community heating scheme for this development.

4.3 Combined Heat and Power

The electricity delivered to a building by the national grid typically represents 30% of the fuel taken to generate it; the rest of the primary fuel (coal, gas, oil) has been lost in waste heat and distribution losses. Combined Heat and Power (CHP) generates the electricity on site and recovers the waste heat for heating and/or hot water. This improves the total efficiency of the system to approaching 80% utilisation of the primary fuel.

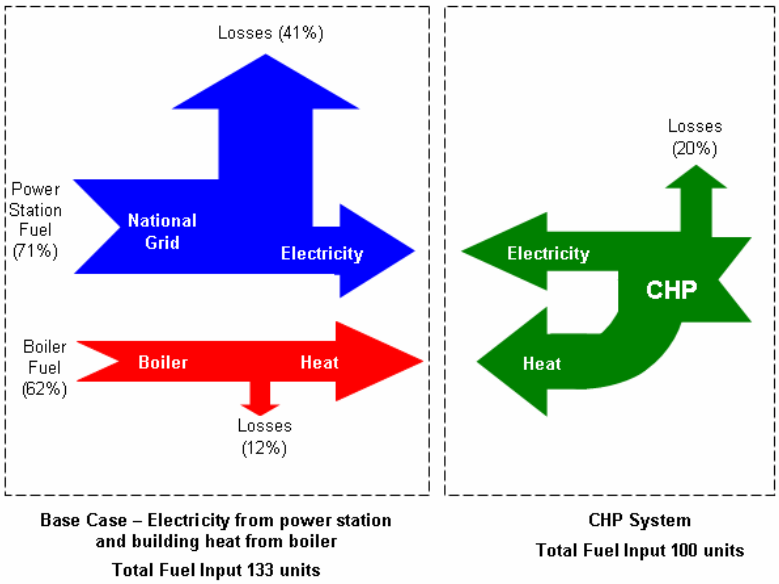

Figure 5 Combined Heat and Power Plant Savings

For each unit of electricity produced 2 to 4 units of waste heat are produced. Therefore to maximise the efficiency of the system a constant heating requirement is required, e.g. a swimming pool, to dissipate the waste heat whilst the electricity is being generated.

CHP is considered a low-carbon technology rather than a renewable technology unless biomass is used for the fuel source. Biomass CHP is in its infancy and currently they are only designed for large scale solutions (exceeding 1MW electrical power) such as town planning schemes, rather than individual buildings.

The main advantages and disadvantages of a CHP system are discussed below:

Advantages:

- ✓ Effectively make use of waste heat.
- ✓ Good for an application with a constant heating requirement.
- ✓ Reduced energy consumption and subsequently CO_2 emissions.

Disadvantages:

- × Micro-CHP is a relatively new and unproven technology.
- × Not strictly a renewable technology.
- × Without a constant heat load (i.e. summer months) heat must be rejected.

4.3.1 CHP Project Impact

Due to the size of the development we would not recommend a CHP system. For a CHP system to be viable or practice it would need to run for at least 12 hours a day. The energy modelling results have also shown that there is not a significant year round heating demand for the development therefore we would not recommend a CHP system.

4.4 Wind Turbines

Wind turbine technology is tried and tested at a scale from a few hundred Watts to offshore Mega Watt installations. Wind turbines have been successfully employed in urban environments. The power output from wind turbines is related directly to the wind speed, and the diameter of the blade rotor. In an urban environment, wind speed is limited by the terrain and height and the size of the turbine is limited by planning and aesthetic requirements.

There are no set guidelines for the interspacing of wind turbines relative to one another; however, it is known that the output of turbines is reduced if placed in close proximity of another turbine. Wind modelling would need to be completed to determine the output if a development was to use multiple turbines. For a building mounted wind turbine, there needs to be enough space on the roof to lay the turbine horizontally before it is winched up to its vertical position.

The advantages and disadvantages of wind turbines in an urban environment are discussed below:

Advantages:

- ✓ Wind turbine itself has a high visual impact, creating a statement about using renewable technology.
- ✓ Simple technology.

Disadvantages:

- × Wind is not a reliable resource.
- × Small turbines have a relatively poor performance. Many local authorities are questioning the manufacturer's claimed performances.
- × Turbine may impact on neighbouring building views.

Figure 5 North Hoyle Off-shore Wind Farm

(www.greenpeace.org.uk)

Figure 6 Vertical Axis Wind Turbine

(www.quietrevolution.co.uk)

4.4.1 Wind Turbine Impact for the Development

The annual mean wind speed for this site (data from the Department for Business, Enterprise & Regulatory Reform [BERR] web site) is shown in Table 10 below. The BERR takes input in the form of grid reference which can be converted from a building's postcode.

Table 10 Wind Speed Results for the Development Site

Level Above Ground (m)	Wind Speed (m/s)
10 m	4.8
25 m	5.6
45 m	6.1